camp and jungle life; for, by the fortune of circumstances, it falls within my province not only to make collections, but to preside over their arrangement for exhibition. And the advantages of this dual function are self-evident: a tour concluded, the work of museum arrangement commences; and here one is met with an obvious difficulty at the outset. For two systems of arrangement are possible, each with much to be said both for and against it, and a selection of one or the other has to be made; for the material collected, and available space will not, as a rule, suffice for both. Either the collections may be arranged according to the nature of the exhibit, *e.g.* models of boats, sacrificial utensils, musical instruments, games, images, &c.; or each tribe or community may be represented in its various aspects, animal and social, in a single case or in adjacent cases. For myself, I give the preference to the latter system, mainly on the score of convenience and finality of arrangement. Very effective, I remember, in one of my galleries, were some life-size photographic transparencies of Andamanese heads, presented by Mr. Portman to the ethnological section of the Indian Museum, Calcutta, when I was in temporary charge thereof some years ago. So, too, were the models of the Andamanese, executed, if my memory serves me rightly, by a Bengāli modeller. But the utility of most models, which I have seen, is marred by the want of care in representing the colour of the skin, and in decorating the model with the proper jewellery, which, in many cases, is absolutely characteristic of a particular tribe.

Writing elsewhere, I said: "The more remote and unknown the race or tribe, the more valuable is the evidence afforded by the study of its institutions, from the probability of their being less mixed with those of European origin." Tribes which, only a few years ago, were living in a wild state, clad in a cool and simple garb of forest leaves, buried away in the depths of the jungle, and living, like pigs and bears, on roots, honey, and other forest produce, have now come under the domesticating, and sometimes detrimental influence of contact with Europeans, with a resulting modification of their conditions of life, morality, and even language. The Paniyans of the Wynaad and the Irulas, who inhabit the slopes of the Nilgiris, now work regularly for daily wage on planters' estates; and I was lately shocked by seeing a Toda boy studying for the third standard, instead of tending the buffaloes of his "mand." Ample proof can be adduced in support of the fact that European influence, import-trade with other countries, and the struggle for existence, are bringing about a rapid change (sad from an ethnographic standpoint) among the natives of Southern India, both tame and wild. It has recently been said that "there will be plenty of money and people available for anthropological research when there are no more aborigines"; and it behoves our museums in Great Britain and its dependencies to waste no time in completing their anthropological collections.

I gathered from observation when in London (1) that man as a social and intellectual being is illustrated with the unavoidable want of proportion, when no systematic scheme for the regular expansion of the collections is at work at the British Museum, Bloomsbury; (2) that it is under contemplation to illustrate man and the varieties of the human family from a purely animal point of view at the British Museum (Natural History), South Kensington; (3) that skulls must be sought for at the Royal College of Surgeons, Lincoln's Inn Fields; (4) that lectures and anthropological literature are available to members at the Anthropological Institute, Hanover Square. To this must be added (5) Mr. Galton's laboratory. Surely a great want of centralisation, such as might well be remedied, is indicated here. And as I wandered, both in and out of the London season, through the deserted galleries of the Imperial Institute, I could not refrain from speculating whether, with a radical change of policy for good, this much-discussed building could not be converted into our great National Museum of Ethnology, where man shall be represented fully and in every aspect, and where those interested in ethnological research could find under one roof a skilled staff to appeal to in their amateur difficulties, collections, literature, lectures, and anthropological laboratory. For the great mass of visitors to popular museums, who come under the heading of sightseers, it is of primary importance that the exhibits should be attractive. And I feel convinced that, were an ethnological museum up to the high standard of the British Museum (Natural History) established, it would, when its reputation became known, be, like Madame Tussaud's, widely resorted to by the general public, and that, by an admixture of free and paying days, and by the charge of a small fee for examination in the laboratory, it might be made to a certain extent self-supporting, and not entail a great burthen of expenditure on the State. EDGAR THURSTON.

Madras Government Museum.

NOTES.

WE are glad to notice that the Queen's birthday honours include the name of Dr. John Murray, F.R.S., of *Challenger* renown, who has been appointed a Knight Commander of the Order of the Bath (K.C.B.).

THE Chemical Society's banquet to Lord Playfair and six other past presidents who have completed fifty years' fellowship of the Society, is to be held at the Hôtel Métropole on Thursday, June 9.

THE death is announced of M. Souillart, professor of astronomy in the University of Lille, and correspondant in the Section of Astronomy of the Paris Academy of Sciences.

THE Department of Science and Art has received information that the fifth International Congress of Hydrology, Climatology, and Geology will be opened at Liége on September 25.

THE eighty-first annual meeting of the Sociéte helvétique des sciences naturelles will be held at Berne on August 1-3. This will be the sixth occasion upon which Berne has been the meeting-place of the Society. The reception will take place in the great hall of the Museum on the evening of Sunday, July 31. On the following day there will be a general meeting, a banquet, and a fête, and the sections will meet for the consideration of papers on August 2. The sections and their presidents are as follows:—Mathematics, astronomy and physics, MM. Graf, Huber, Sidler; chemistry, MM. de Kostanecki, Friedheim; botany, M. L. Fischer; zoology, M. Th. Studer; anthropology, M. Th. Studer; geology, mineralogy, petrography and palæontology, M. A. Baltzer; physical geography (comprising geodesy and meteorology), M. E. Brückner; anatomy and physiology, MM. Strasser and Kronecker; medical clinics, MM. Kocher, Müller, Sahli; hygiene and bacteriology, MM. Girard, Tavel; pharmacy and alimentation, M. Tschirch; veterinary science, M. Berdez; agriculture and sylviculture, M. Coaz.

AT the Royal Institution on Thursday, June 2, Dr. Edward E. Klein delivers the first of two lectures on "Modern Methods and their Achievements in Bacteriology," and on Saturday, June 4, Dr. Richard Caton begins a course of two lectures on "The Temples and Ritual of Asklepios at Epidaurus and Athens." The Friday evening discourse on June 3 is by Prof. W. M. Flinders Petrie, on "The Development of the Tomb in Egypt"; that on June 10 is by Lord Rayleigh, whose subject is "Some Experiments with the Telephone."

As the result of a bacteriological examination, Dr. Haffkine has reported that the recent sudden outbreak in Calcutta was due to true bubonic plague. A long and detailed statement of the facts referring to the outbreak, and the measures taken by the Government of Bengal to prevent its spread, is given in the *Pioneer Mail* of May 6. As a preventive measure, inoculation with the prophylactic virus prepared by Dr. Haffkine is recommended. It has been found that inoculation by this material prevents from 80 to 90 per cent. of deaths from plague, and reduces the plague from an epidemic form to the position of a sporadic disease. Surgeon-General Harvey was deputed by the Government of India last month to Bombay specially to examine the results of Dr. Haffkine's methods, and his report is stated to be generally favourable to the system of inoculation. The Government of Bengal have therefore decided to exempt from liability to segregation all families which have been entirely inoculated prior to the occurrence of any case of plague among them. Inoculation is not to be forced on the people, but if a member of a completely inoculated family is attacked by the plague, neither he nor his family will be liable to removal to a segregation camp.

At the anniversary meeting of the Royal Geographical Society on Monday, the medals were presented as already announced (p. 38). In the course of his address, the President said that a very sympathetic reply had been received from the Prime Minister's private secretary to the appeal on behalf of a Government Antarctic expedition. A German expedition was being organised on a liberal scale, and funds were being collected throughout Germany for the purpose. Moreover there was reason to hope that the Norwegian Government might send out an expedition also, perhaps under the leadership of Dr. Nansen, to carry out exploration mainly on land. Meanwhile the Belgian expedition, under M. de Gerlache, had been actively engaged, and the expedition, liberally supported by Sir George Newnes, under Mr. Borchgrevink, was in an advanced state of preparation. After a brief reference to Mr. Jackson's account of the Jackson-Harmsworth expedition, to Lieutenant Peary's labours, and to those of Captain Sverdrup, Colonel Fielden, Mr. Pearson, Mr. Arnold Pike, and Sir Martin Conway, the President said that German and Swedish expeditions were in progress for Spitsbergen and Franz Josef Land. Germany was setting an admirable example in scientific exploration. Besides the Antarctic expedition referred to, the German Government had made a grant of 15,000*l.* for oceanic research, especially in the Atlantic and Indian oceans. In the North Atlantic much good work was done under the joint co-operation of the Swedish, Norwegian, German, and British Governments. He hoped that during the coming summer authentic and satisfactory information concerning the hazardous balloon expedition undertaken by M. Andrée would be received.

Mr. Borchgrevink has given to a representative of Reuter's Agency some details of the arrangements for the Antarctic expedition which will shortly leave for Australia and South Victoria Land. He said that his ship, the *Southern Cross*, has been designed by the builder of the *Fram*, and has 10 feet of solid oak at her bows, and at her weakest point is 32 inches in thickness. Over all she is sheathed with 3 inches of American greenheart—a wood which never splits, and is very hard and slippery. The *Southern Cross* will fly the British flag, and will leave London in July. A pack of sixty-five Siberian sledge-dogs will be taken, and a number of sledges for the inland journey on the South Victorian continent. The object of the expedition is to explore South Victoria Land, and to investigate the seas and islands between there and Australia. Mr. Borchgrevink is taking with him stores for three years and a supply of carrier-pigeons.

Information of the death of Mr. Edward Wilson, F.G.S., who for the past fourteen years has been Curator of the Bristol Museum, has been received from Mr. F. W. Knocker, Sub-Curator of the Museum. Having a good general knowledge of zoology and botany, and an extensive acquaintance with geology, Mr. Wilson was admirably fitted for his position. His efforts to enrich the Museum were zealous and untiring, and he was engaged during the last month of his life in procuring a large collection of mammalian remains and some worked flints from the cavern-deposits of Uphill, near Weston-super-Mare. He had likewise arranged in the Museum a special students' collection of minerals, rocks and fossils, of which he prepared a separate catalogue, in addition to his numerous issues of the "Guide to the Bristol Museum." For many years prior to his removal to Bristol, Mr. Wilson had been a science teacher at Nottingham, and he was there led to pay particular attention to the Permian and Triassic strata, the Rhætic beds and the Lias, to our knowledge of which he made considerable additions in papers dating from 1868. In 1885 he published an important article on the Marlstone of Leicestershire as a source of iron. Later on he devoted himself more especially to the study of the Liassic Gasteropoda, on which subject he had become our chief authority. He was joint-author, with Mr. W. H. Hudleston, F.R.S., of a Catalogue of British Gasteropoda, 1892. More recently he has laboured in company with Mr. S. S. Buckman at the palæontology of Dundry Hill. A new Liassic Gasteropod was named *Wilsonia* in honour of Mr. Wilson, by Mr. Hudleston, and the Council of the Geological Society awarded to him in 1888 the Murchison Geological Fund. He died after a short illness on May 21, at the early age of forty-nine, and his loss will be widely felt by his many friends. All acquainted with him entertained the highest regard for his gentle unassuming character, as well as for his able and painstaking researches.

The report of the Committee appointed by the Society of Arts to consider the causes of the deterioration of paper is printed in the current number (May 20) of the Society's *Journal*, and is here summarised. At the outset, the report points out that during the present century the paper-making industry has undergone many revolutionary changes. As an industry it has grown considerably, and to meet the requirements of the enormously increased production a quantity of new fibrous raw materials have been introduced and have taken their place in due course as indispensable staples. The more important of these, so far as concerns this country, are esparto, in the period 1860-70; "mechanical wood" or ground wood pulp, in 1870-80; the wood celluloses, in the period 1880-90. These substances differ in chemical composition from the celluloses obtained from cotton, flax and hemp, which were the exclusive staple raw materials for paper making up to this century; and although they are efficient substitutes in most respects, it must be admitted that time has not yet been able to pronounce a judgment upon the relative permanence of the papers made from them. There is more than a suspicion that many of them are very inferior in this important respect, and it has been the main purpose of the work of the Committee to sift the evidence upon which such suspicions have been engendered.

The Committee referred to above have examined a number of books as evidence of "deterioration of paper"; some submitted by librarians in a condition of complete disintegration; some of their own selection exhibiting various grades of deterioration of the paper of which they are composed. They conclude on the evidence before them as follows:—As to the two tendencies to deterioration of papers these are marked (1) by disintegration, (2) by discoloration. They are independent effects, but may be concurrent. They are notably so in papers containing mechanical wood pulp. Actual disintegration has been brought to light in papers of all grades; from those of the best quality as regards the fibrous materials of which they are composed, *i.e.* rag papers; also of course in those of lowest quality, *i.e.* containing mechanical wood pulp in large proportions. It is generally the result of chemical change of the fibres themselves. As to the causes determining such changes: in the case of the rag papers examined the effects appear to be due to acid bodies; the disintegration may be generally referred to acidity. In the case of mechanical wood pulp the effects are traceable to oxidation pure and simple; the disintegration is accompanied by a basic or alkaline reaction of the paper. Discoloration may be said also to affect all papers more or less, and without discussing minutely the chemistry of the changes, the evidence obtained certainly warrants the general conclusion that discoloration of ordinary cellulose papers (as distinguished from those containing mechanical wood pulp) under usual conditions of storage is proportional to the amount of rosin which they contain, or more generally to the rosin and the conditions employed for fixing it in the ordinary process of engine-sizing. The Committee have been desirous of bringing their investigations to a practical conclusion in specific terms, viz. by the suggestion of standards of quality. They limit their specific findings to the following, viz. (1) normal standard of quality for book papers required for publications of permanent value. For such papers they specify as follows:—Fibres: not less than 70 per cent. of fibres of the cotton, flax, and hemp class. Sizing: not more than 2 per cent. rosin, and finished with the normal acidity of pure alum. Loading: not more than 10 per cent. total mineral matter (ash).

THE Röntgen Society has appointed a Committee to inquire into the alleged injuries produced by exposure to Röntgen radiation. In order to obtain accurate information, the committee has prepared a set of questions framed with a view of determining the cause or causes of the injuries received.

A NOTE in *Comptes rendus* (May 9) states that M. Mascart has received information that Prof. Leist has found at Kotchétovka, in the province of Kursk (Russia) a local magnetic pole; that is to say, a point where a dipping needle stands vertical. It is necessary to move twenty metres from this point to change the direction of the needle by 1°. The declination needle sets itself indifferently in any direction in the spot where this magnetic anomaly occurs.

M. VINCENT stated at a meeting of the Academy of Medicine, held on May 10 (says the *Lancet*), that he has found that French soldiers are on an average a hundred times more subject to typhoid fever than native soldiers—a singular observation, because this disease is in general serious when it attacks Arabs. The comparative exemption of the Arabs depends, in his opinion, neither on a previous attack nor on a slow acclimatisation consequent on residence in towns, but on a natural immunity comparable to the immunity of negroes against yellow fever, or of Algerian sheep against anthrax.

THE U.S. Weather Bureau has published in its *Bulletin* No. 21, an abstract of a report on solar and terrestrial magnetism in their relations to meteorology, by Prof. F. H. Bigelow, who has during the last six years devoted much time to the study of the fundamental principles of this important subject. It is stated in the introductory text that he is of opinion that the atmospheric conditions which culminate in the storms traversing the United States are in part dependent upon the solar energy that reaches the earth in the form of magnetic force, and that there are synchronous fluctuations in the pressures and temperatures of the north-western regions of the American continent in the neighbourhood of the magnetic pole. Prof. W. L. Moore, the chief of the Weather Bureau, is of opinion that while at this stage of the investigation the sequence of cause and effect is not shown with sufficient definiteness to justify the weather forecaster in attempting to apply these theories in predicting marked atmospheric disturbances, the paper will lead to discussion and result in further additions to our knowledge of magnetic science.

Petermann's Mittheilungen publishes a new map of the central highlands of northern German East Africa. Much new matter is introduced by the addition of the surveys made by Premier-Lieut. Werther on the so-called Irangi expedition during 1896 and 1897; the map itself is drawn by Dr. B. Hassenstein. A paper describing the main features of the country traversed by the expedition is appended by Lieut. Werther.

PROF. A. SUPAN contributes a careful analysis of the reports and statistics of trade in China for the year 1896 to *Petermann's Mittheilungen*. The results lead him to expect immense developments from the construction of railways, even within the next decade, and he believes the establishment of Germany at Kiaou-tschou will mark the beginning of a new era in the trade of that country.

WE have received the index to the first ten volumes of the *Mittheilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten*. The index, which covers the years 1888 to 1897, is arranged under six separate headings, four of which are subdivided according to the different colonies. Dr. von Danckelman is the editor.

THE *Verhandlungen des naturhistorischen Vereins der preussischen Rheinlande* contains a long paper, by Herr R. Hundt, on the petrography and palæontology of the middle Devonian rocks of south-west Prussia. The geology of the *Lenneschiefer* beds is discussed in detail, and a comparison with the Calceola beds of the Eifel is based on the distribution of fossils of Calceola and Stringocephalus. A map of the region is appended.

A RECENTLY issued part of the *Proceedings* of the U.S. National Museum (vol. xx., No. 1134) contains an important contribution to our knowledge of the ornithology of the Philippine Islands, by Messrs. Worcester and Bourns. The first portion of this memoir consists of a complete list of the 526 birds as yet known to inhabit the various islands of the Philippine archipelago and of those of the adjoining group of Palawan in a tabular form, and shows their occurrence or absence in thirty-seven islands of the two series. Taking this list as a text, Mr. Worcester proceeds in the second portion to discuss the very interesting problems presented by the distribution of the birds in these islands. Each island is taken in order, a list of its known birds is given, and its relationships, as thus shown, are worked out. Mr. Worcester comes to the conclusion that Mr. Everett's view (*Proc. Zool. Soc.*, 1889) that Palawan and its satellites belong ornithologically to Borneo, and not to the Philippines, is amply confirmed by recent evidence. Turning to the Philippines proper, the author shows that the five "sub-provinces" into which Dr. Steere, in 1894, proposed to divide the Philippine area are not maintainable. Nor is Mr. Worcester better satisfied with Dr. Steere's deduction that each genus of Philippine birds is represented by a single species only in each island. The contrary is manifestly the case in many instances. The memoir is illustrated by a map and numerous diagrams, and is worthy of careful study by all who are interested in laws of geographical distribution.

ONE of the most important services performed by the Agricultural Experiment Stations found in almost every one of the United States, is the instruction of the farmer and the fruit-grower in the life-history of the animal and vegetable foes which destroy or injure his crops, and in the mode of combating them.

From the Cornell University Experiment Station, located at Ithaca, N.Y., we have received *Bulletin* No. 145, devoted to two important diseases of the pear, the "leaf-spot" (*Septoria piricola*), and the "leaf-blight" (*Entomosporium maculatum*), by Mr. B. M. Duggar, admirably illustrated; and from that for the University of Wisconsin *Bulletin* No. 65, on a bacterial rot of cabbage and allied plants (*Bacillus campestris*), by Mr. H. L. Russell, also well illustrated. These bulletins and the annual reports are sent free to all residents in the State on request. From the Michigan State Station we have also received *Bulletins* Nos. 151–153, containing a very large amount of practical information on the growth of vegetables and fruits suitable for cultivation in that State.

In a recent article (March 17, p. 464) on the resources of the West India Islands, reference was made to the necessity for supplementing the staple products by the introduction of a variety of cultural industries which would increase the wealth of these Colonies. The obvious way to lead to such developments is to establish a department of economic botany, for the purpose of carrying out systematic experiments concerned with agricultural cultivation, wherever necessary, and to extend the equipment of existing botanic gardens so that proper attention can be given to the introduction of new plants. Mr. J. H. Hart, the Director of the Royal Botanic Gardens at Trinidad, in a lecture reprinted in the *Bulletin* of the Gardens, shows that many at present minor industries might be developed with profit in the Colony. He points out that Trinidad could grow enough mahogany and cedar to supply the markets of Great Britain, and if the island was simply a mahogany and cedar forest, it would be one of the richest of our colonial possessions. Yet no one plants cedar trees in the island, and no one plants mahogany. Jamaica exports logwood to the value of 300,000*l*. annually, but Trinidad, where logwood of the very finest quality can be grown, sends none to market. Rubber trees grow well in the Island, the trees in the Botanic Gardens yielding from four to six pounds of rubber per tree per annum, but they are not cultivated to any extent outside the Gardens. In addition to these potential crops, Mr. Hart enumerates fifty other products which could be successfully grown in Trinidad. His lecture shows the valuable assistance which botanic gardens are able to give to cultivators; and we are glad to see that the botanical department under his direction is to be extended, land having now been allotted for the purpose of establishing a section for economic and scientific work. The extension encourages the hope that the reproach, that "Trinidad has the wealth of the Straits Settlements going to waste," will soon be removed.

The fifth and sixth Reports on the Yorkshire Carboniferous Flora, by Mr. Robert Kidston, are reprinted from the *Transactions* of the Yorkshire Naturalists' Union.

The third edition of Mr. W. T. Lynn's little book on "Remarkable Eclipses" has just been issued by Mr. Edward Stanford. The book has been brought up to date by mention of the total solar eclipses of August 1896, and January last.

A second edition of "Applied Bacteriology," by Messrs. T. H. Pearmain and C. G. Moor, has just been published by Messrs. Baillière, Tindall, and Cox. Several parts of the book have been enlarged and improved, and the whole has undergone revision. A short account of the bacteriology of sewage has been added. The volume provides students, medical officers of health, analysts and sanitarians with a good general survey of the science of bacteriology.

The second part of Mr. W. P. Hiern's "Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853–61," comprising the natural orders of Dicotyledons from Combretaceæ to Rubiaceæ, has just been published by the Trustees of the British Museum (Natural History). Another publication which has just been issued from the Museum is a list of the types and figured specimens of fossil Cephalopoda in the collection, prepared by Mr. G. C. Crick.

Three papers of interest to anthropologists appear in the *Proceedings* of the Royal Society of Tasmania (1897). One contains the results of measurements of the crania of Tasmanian aboriginals now in the Hobart Museum, compared with measurements of the skulls of Europeans, by Dr. A. H. Clarke and Mr. W. E. Harper. The authors do not attempt to draw conclusions as to the origin of the Tasmanian aboriginals, nor to define their characteristics; but the measurements of the skulls of an extinct race constitute a work of value to anthropologists. The two other anthropological papers in the *Proceedings* are by Mr. J. B. Walker; they contain a number of interesting notes on the Tasmanian aborigines, extracted from the journals of his father.

The Rev. Prof. G. Henslow has in preparation a volume entitled "Medical Works of the Fourteenth Century," consisting of transcripts with notes from four MS. volumes contemporary with the works of Wiclif and Chaucer. These transcripts will furnish illustrations of the crude and quaint conceptions of the value of plants as drugs prevailing in the Middle Ages. The volume will also contain an alphabetical list of upwards of 700 medical and other plants mentioned in works of the fourteenth century, compiled and identified with their modern English and Latin equivalent names.

Prof. T. W. Richards, of Harvard, whose name is already identified with the accurate determination of atomic weights, has recently published the results of a redetermination of the atomic weights of nickel and cobalt. The close approach to equality in the atomic weights of these elements has always given a special interest to any such redetermination, and this interest has been increased in recent times by the suggestion that the two elements are ordinarily associated with a third new element—"gnomium," which is not separated from them in the usual course of analysis. The evidence on which this suggestion was based by Krüss and Schmidt was subsequently rebutted by the work of Winkler; yet Winkler's own determinations of the atomic weight of cobalt by two different methods gave results which differed by 1 part in 200, viz. 59·82 and 59·52. Still later determinations by Hempel and Thiele, by three methods, gave respectively 58·99, 58·78 and 58·91. The method employed by Prof. Richards consisted in the preparation of the bromides of nickel and cobalt, and their analysis by means of pure silver nitrate. The greatest precautions were taken in order to obtain pure anhydrous materials, and the same methods of manipulation employed as in the previous case of the determination of the atomic weight of magnesium. The fourteen experiments with nickel bromide agree remarkably, the extreme differences being just over 1 part in 1000. Thirteen experiments with cobalt bromide show an equally good agreement. The numbers given finally are for nickel 58·69 and cobalt 58·99 ($O = 16$). Prof. Richards, anticipating the criticism that his determinations are based on a single method, remarks that a series of carefully conducted determinations by a single reliable method have especial value in the case of nickel and cobalt, where hitherto accuracy has been sought by varying the methods rather than by securing constancy in the results attainable by any one of them. Prof. Richards concludes that discrepancies among previous determinations of the atomic weights of nickel and cobalt afford no evidence of the existence of the hypothetical gnomium, nor do his own observations in any way indicate the existence of such an element.

THE additions to the Zoological Society's Gardens during the past week include a Guinea Baboon (*Cynocephalus sphinx*, ♂) from West Africa, presented by Captain H. de la Cour Travers; a Vervet Monkey (*Cercopithecus lalandii*, ♂) from South Africa, presented by Mr. C. J. Barratt; a Common Raccoon (*Procyon lotor*) from North America, presented by Mr. A. D. Jenkins; a Reindeer (*Rangifer tarandus*, ♂) from Newfoundland, presented by the Hon. M. A. Bourke, H.M.S. *Cordelia*; a Common Guillemot (*Lomvia troile*), British, presented by Mr. Ernest Horne; a Seven-banded Snake (*Tropidonotus septemvittatus*) from North America, presented by Mr. James Meldrum; a Barbary Ape (*Macacus innus*, ♂) from North Africa, a Red-River Hog (*Potamochærus penicilliatus*) from West Africa, a Beccaris Cassowary (*Casuarius beccarii*) from New Guinea, two Orange-winged Amazons (*Chrysotis amazonica*), two Blue-fronted Amazons (*Chrysotis æstiva*) from South America, deposited; a Leucoryx Antelope (*Oryx leucoryx*, ♂) from North Africa, purchased; a Red-winged Parrakeet (*Ptisles erythropterus*, ♀), a Long-billed Butcher-Crow (*Barita destructor*) from Australia, received in exchange; two Japanese Deer (*Cervus sika*, ♂ ♀), three Shaw's Gerbilles (*Gerbillus shawi*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JUNE:—

June 3.	6h. 34m. to 9h. 25m. Transit of Jupiter's Sat. III.
4.	8h. Eastern elongation of Saturn's Sat. Japetus.
4.	8h. 10m. to 9h 11m. Occultation of Λ Ophiuchi (mag. 4·7) by the moon.
4.	15h. 43m. to 16h. 34m. Occultation of B.A.C. 5909 (mag. 6·2) by the moon.
5.	10h. 15m. to 11h. 22m. Occultation of λ Sagittarii (mag. 3·1) by the moon.
9.	11h. 31m. to 12h. 23m. Occultation of B.A.C. 7804 (mag. 6·1) by the moon.
9.	Saturn. Outer minor axis of outer ring, 18″·62.
10.	10h. 23m. to 13h. 16m. Transit of Jupiter's Sat. III.
12.	19h. Neptune in conjunction with the sun.
15.	Venus. Illuminated portion of disc 0·853.
15.	Mars. ,, ,, ,, 0·919.
15.	Jupiter. Polar diameter, 34″·8.
15.	Saturn. ,, ,, 17″·0.
17.	9h. 45m. to 11h. 23m. Transit of Jupiter's Sat. IV.
18.	10h. 59m. Minimum of β Persei (Algol).
23.	5h. Inferior conjunction of Saturn's Sat. Japetus.
29.	Saturn. Outer minor axis of outer ring, 18″·33.

The transit of Jupiter's fourth satellite on June 17 is the only one visible during 1898.

BLURRING ABERRATION IN THE TELESCOPE.—Some time ago we referred in this journal (December 30, 1897, p. 200) to a communication by Prof. Schæberle which pointed out that the optical image of a celestial object, formed in the focus of a reflecting telescope of great angular aperture, is possessed of errors of definition which arise from a cause hitherto unrecognised by mathematical and practical opticians. The main results of this paper briefly summed up are as follows:—First, that the focal plans of a curved reflecting surface for parallel rays impinging thereon is situated upon the axis, half-way between the centre of curvature and the reflecting surface itself; and, second, that the plane of the image formed by each small patch of the converging surface tends to lie at right angles to the path of the focussed rays, so that the images formed from every minute portion of the reflecting surface, while their centres may coincide on the axis of the telescope, all tilt from the focal plane directly as the extreme of aperture is approached, or as the focal point is shifted from the axis. In the *Transactions* of the Astronomical and Physical Society of Toronto for 1897, Mr. J. R. Collins, in referring to Prof. Schæberle's paper, points out that it is possible to so proportion the curvatures of the reflecting surfaces of the Gregorian form of reflecting telescope (where the image is formed by the large reflector in front of the small concave mirror, and the light is thrown back to a focus on the axis through an opening in the centre of the large reflector to the eye-piece), as to completely correct the tilt and want of uniformity of dimensions of the components of the compound image, that it may reach the front of the eye-piece entirely freed from these defects. It may be remarked that the tilting of the image not only occurs in the case of the reflector, but in that of the refractor also, the effect in the latter case being twice as great as that in the former. In fact, the Schæberle aberration is a defect that exists in all forms or combinations of lenses, and must, therefore, be taken into account if we wish to attain maximum efficiency in definition.

PHOTOGRAPHY BY THE AURORA BOREALIS.—Mr. J. E. Turner, writing in *The Amateur Photographer* for May 6, describes a unique photograph which he has obtained. It seems that on April 15 Gourock was visited by a very vivid display of the aurora borealis, which lasted from 10 to midnight. The moon having set at 9.13 p.m. and not rising again until 4.5 a.m. the next morning, he thought it might be possible to get a photograph merely by the light of the aurora borealis, and he consequently exposed a plate towards the northern horizon, giving an exposure of only two minutes with f/8 and a Paget xxxxx. plate. The negative, when developed with a very weak pyro and ammonia developer for about one hour, came out well and showed clearly the nearest land that was three miles distant, together with the houses, which were clearly defined, besides numerous trees in the foreground. The photograph is reproduced in the above-named journal. It is not mentioned whether an impress of the aurora itself was obtained, but only the statement: "the stars also nearest the zenith are faintly seen, the light from the aurora, of course, obscuring them."

MR. TEBBUTT'S OBSERVATORY.—The Report of Mr. Tebbutt's Observatory at Windsor, New South Wales, for the year 1897, shows that the number of observations made is up to the standard of former years. The 8-inch equatorial was employed for observing occultations of stars by the moon, 134 phases being noted, and numerous minor planets. Perrine's comet was also diligently watched for several weeks, and many variable stars and phenomena of Jupiter's satellites observed. The meteorological observations have been as usual regularly made. Seven years' meteorological observations are now in hand, and will be soon published; and when this is completed, there will be a period of thirty-five years of published data which will be invaluable for investigating the local climate. In consequence of recent local legislation, Mr. Tebbutt writes: "A notice was sent to the Minister of Public Instruction on October 11 last, that it was intended at the close of the year to discontinue the meteorological department, and the hope was expressed that the Government would see fit to continue the work at its own expense. A reply was received stating that the work would be continued . . . at the Hawkesbury Agricultural College, about four miles west of the Observatory." Such an arrangement as this was evidently very satisfactory, for it would have been a crime to have suddenly broken the continuity of what must be valuable data for investigating the climatic conditions of New South Wales. "After due inquiry," as Mr. Tebbutt further states, "at the close of the year, it turned out, however, that provision had not been made for continuing the Windsor meteorological work in all its departments. It is proposed to continue at this observatory observations of the daily rainfall by the two gauges, and to secure the monthly maximum and minimum air temperatures." We hope that the Government will not be long in seeing that due attention must be paid to the question of meteorology in New South Wales, and that, after private enterprise has carried on the work for so many years, it becomes a duty to see that a breach in the continuity of the observations is not made through lack of funds.

SOME NEW STUDIES IN KATHODE AND RÖNTGEN RADIATIONS.[1]

THE researches of Crookes, Lenard, and Röntgen have given to man a new eye; they have, perhaps, also given to nature a new light; they have certainly given to science more than one new problem. A vacuum tube may appear but a simple piece of apparatus; but were we acquainted in their entirety with the secrets that it contains, we should know much at present utterly unknown, not only as regards electrical action, but also in reference to the fundamental constitution of matter, and the

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[1] Abstract of Friday evening discourse delivered at the Royal Institution on February 4, by Alan A. Campbell Swinton.